



U.S. Army Research, Development and Engineering Command



***TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.***

MATREX Simulation Architecture

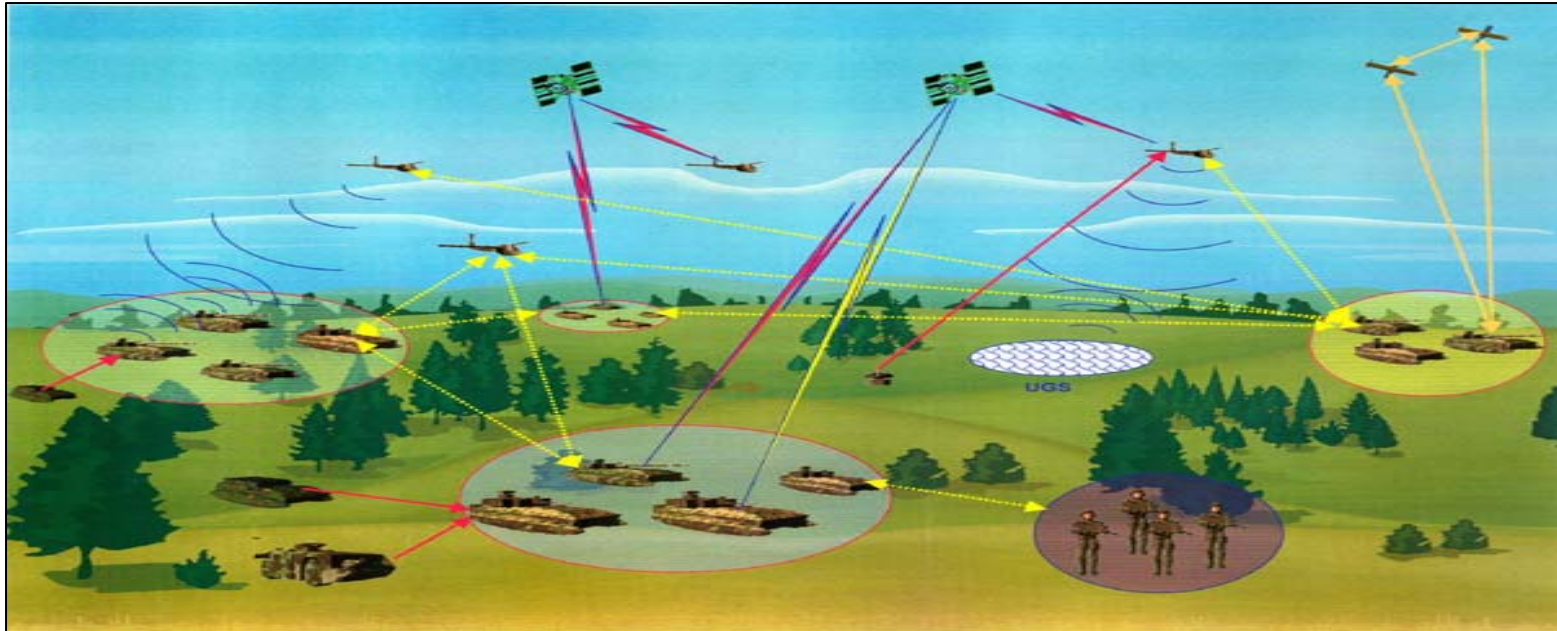
DoD M&S Conference

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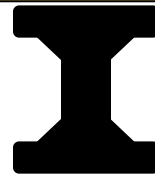
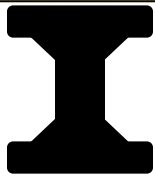
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The MATREX program has a mission to provide a collection of multi-fidelity models, simulations and tools are integrated into an established architecture to conduct analyses, experimentation and technology trade-offs.

Modeled Military Phenomenon  
& Services / Functions



Simulation  
Support Services



**Data Collection & Analysis**

**Simulation Initialization**

**System Monitoring / Management**

**Software Tools for System Integration & Testing**

**M&S Architectural Design Pattern Best Practices**

- The MATREX architecture is designed to provide a robust, scalable and multi-resolution M&S environment intended to be used for the following purposes:
  - Network-Centric Warfare (NCW) analysis
  - Support of experimentation
  - Technology tradeoffs
  - Gaps assessment
  - Concept development
  - Testing
- Modeling capabilities for information representation and human behaviors, supported by Army models to simulate the battlefield, gives analysts the ability to conduct experiments to study the effect of information on decision making
- Our Service-Oriented Architecture (SOA) provides for a multi-resolution, composable, extensible and scalable environment
- We can drive system design by selection of functional capabilities
  - The MATREX has implemented a Systems Engineering product to link military functional requirements to simulation application specifications through system design

- The collection of RDECOM high fidelity and high resolution models provides a collaborative and thorough modeling & simulation environment with best of breed models closely integrated and managed
- Our Service-Oriented Architecture design paradigm best fits the MATREX architecture functional goal decomposition for the following reasons:
  - Allows coordination of M&S capabilities at a macro level.
  - Enables delegation of capabilities to the appropriate center of excellence.
  - Eases ability for consistent (fair fight) modeling of operational capabilities.
  - Provides composable simulation environment with user defined resolution, fidelity and model selection.
  - Encapsulation for autonomy and optimization of services.
  - Interface abstraction for consistency and limited changes to the system with each service modification.

- Functional Architecture Features
  - Functionally integrated and synchronized set of warfare modeling capabilities
  - Emphasis on functions required to analyze Network-Centric Warfare (NCW)
    - Information dissemination & Common Operating Picture (COP) management
    - Human behavior modeling
    - Multiple fidelity & multi-resolution functional services
    - Unmanned systems
    - Environment and more
- Technical Architecture Features
  - Service-Oriented Architecture to facilitate function encapsulation, functional expertise delegation, flexibility and composability for multiple customer use cases
  - System-wide design patterns to facilitate centralized system management including simulation initialization and data collection and analysis
  - Advanced federate and system-wide testing capability,
  - System monitoring and management down to the component level
  - Collection of models functionally integrated to perform the required functions of NCW
  - Ability to run simulation environment on multiple simulation transport protocols



- Network Centric Warfare decomposition, functional capabilities & data collection for analysis
- Simulation support tools including scenario ingestion, simulation initialization, advanced testing, and a development library for middleware abstraction
- Cross-domain collaboration to support modeling & simulation
- Full integration of OneSAF into the MATREX architecture
- Support for additional middleware protocols
- FCS LSI Support via models and system architecture
- Experiment support for multiple sites

- RDECOM (RDEC's)
  - Aviation and Missile Research, Development and Engineering Center (AMRDEC)
  - Armament Research, Development and Engineering Center (ARDEC)
  - Army Research Laboratory (ARL)
  - Communications-Electronics Research, Development and Engineering Center (CERDEC - Belvoir/Monmouth)
  - Natick Soldier Research, Development and Engineering Center (NSRDEC)
  - Simulation & Training, Technology Center (STTC)
  - Tank and Automotive Research, Development and Engineering Center (TARDEC)
- FCS/LSI
- ATEC
  - OTC
- TRADOC
  - Battle Laboratory Collaborative Simulation Environment (BLCSE)
  - Mounted Maneuver Battlespace Lab (MMBL)
  - Product Manager Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance On-The-Move (PM C4ISR OTM) Testbed



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